

# **Universal service subsidies and cost overstatement: Evidence from the U.S. telecommunications sector**

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April 11, 2011

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## **Abstract**

Utility subsidies are often defended as promoting universal service. However, specific support formulas may be poorly targeted and/or designed. The U.S. high cost loop support (HCLS) program (formerly referred to as the Universal Service Fund (USF)), has been a key component of the FCC's USF program. With proposed initiatives for universal access to broadband, it is useful to critically evaluate how the HCLS creates a moral hazard problem. This study finds that companies receiving HCLS subsidies have an incentive to report high costs to the FCC in order to qualify for still higher support payments. Using data from 1,136 rural telecom firms in 50 states (1992-2002), this study shows that some companies respond to current incentives by overstating costs (or incurring higher costs) as they approach the subsidy cutoff points. Compared to the no-subsidy group, companies at the point of greatest subsidy jump appear to overstate costs more due to larger marginal benefits. Such perverse incentives need to be recognized in future universal service initiatives.

Keywords: Telecommunications, High Cost Subsidies, Universal Service

## **1. Introduction**

Universal service has been an important theme in telecommunications service in the United States since the 1970s (Mueller, 1993). The Federal Communications Commission (FCC) created the USF to help provide high quality telecommunications services at just, reasonable, and affordable rates throughout the nation.<sup>1</sup> The USF uses fees imposed on telecommunications suppliers of interstate and international services to subsidize low-income households, rural telecommunications companies, eligible schools and libraries, and rural health care providers.

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<sup>1</sup> Retrieved from [http://www.fcc.gov/wcb/tapd/universal\\_service/](http://www.fcc.gov/wcb/tapd/universal_service/)

Although the FCC does not require companies contributing to the USF to recover their contribution directly from their customers, most companies do.<sup>2</sup> The USF contribution factor (the percentage of interstate end-user revenues telecommunication companies must contribute) has increased from 3.19% in 1998<sup>3</sup> to 12.90% in 2010,<sup>4</sup> an average of 12% annual increase over twelve years.

The subsidy program also appears to have invited corruption, manipulation of reported numbers, waste and inefficiencies. To illustrate, Daniel Martino, who had ownership interests in CassTel's parent corporation and control of CassTel, and Kenneth Matzdorff, who had been President of CassTel, were sentenced for inflating expenses of the CassTel Company in order to qualify for \$8.9 million in unwarranted subsidies and disbursements (including 3.5 million from the universal service funds).<sup>5</sup> A *USA Today* article on the USF noted that the Gambino crime family fraudulently drew millions from the universal service fund from 1996 to 2003 by controlling a Missouri rural phone firm. The same *USA Today* article also cited the example of Big Bend Telephone Company with huge overhead waste. This company serves 6,000 customers in Alpine, TX. In 2004, Big Bend spent \$3.6 million, or 25% of total operating costs, on corporate overhead alone. At the same time, the company received \$9.6 million in federal universal service funds. Aside from such anecdotal evidence, there seems to be little systematic analysis of firms' cost behavior under the universal service policy. The purpose of this study is to examine whether the system is suffering from a potential moral hazard problem: service

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<sup>2</sup> Many business customers have been receiving bills containing itemized "universal service charges" since January 1998. See *the Federal Communications Commission's Universal Service Support Mechanisms*, by the Common Carrier Bureau - Enforcement Division - July 1998. Form No. CCB-FS014.

<sup>3</sup> *The Federal-State Joint Board Monitoring Reports*, December 1998, CC Docket No. 98-202. Table 1.7 Universal Service Program Requirements and Fund Factors, the first quarter of 1998.

<sup>4</sup> *The Federal-State Joint Board Monitoring Reports*, December 2010, CC Docket No. 98-202. See Table 1.10 Universal Service Program Requirements and Contribution Factors, the fourth quarter of 2010.

<sup>5</sup> See *United States v. Kenneth Matzdorff*, Case No. 05-00020-CR-W-SOW, Plea Agreement (W.D.Mo. Jan. 18, 2005); *United States v. Richard T. Martino*, Case No. 05-00027-01-CR-W-HFS, Plea Agreement (W.D.Mo. Feb. 23, 2005).

providers might want to take advantage of information asymmetries between them and the agencies that carry out the program to strategically increase the subsidy.

Using the data on 1,136 rural telecom firms in 50 states from 1992 through 2002, this paper examines the density function of reported firm costs near each subsidy threshold, and observes a very small frequency of reported costs just below the thresholds and a corresponding high frequency of reported costs just above the thresholds. This suggests that the telephone companies that receive subsidies have an incentive to report high costs in order to qualify for still higher support payments: at least some companies respond to this incentive by increasing their reported costs at the margin.

Many researchers have examined universal service issues and universal service policies recently. For example, Röller and Waverman (2001) find that telecommunications infrastructure is positively related to economic growth when the telecommunications infrastructure provides nearly universal service. Using engineering data, Faulhaber and Hogendorn (2000) show that the universal service regime leads to fewer competitors in the market at some demand levels. Rosston, Savage, and Wimmer (2008) find that universal service payments to telecommunications suppliers in high-cost regions do not reduce the prices of telecommunications services in rural areas. A number of studies of universal service policy have also measured its impact on the household penetration rate of telephone service (Gasman, 1998; Riordan, 2001; Garbacz & Thompson, 2003; Estache, Laffont, & Zhang, 2003; Hazlett, 2006; Hauge, Chiang, & Jamison, 2009; Holt & Jamison, 2007; Kaserman, Mayo, & Flynn, 1990). Eriksson, Kaserman, and Mayo (1998) empirically examined the relationship between targeted and untargeted universal service and prices and pointed out that the current financing mechanism used to generate subsidy cash flows may have seriously undermined the effectiveness goal of subsidy policies. Ackerberg, Riordan, Rosston, and Wimmer, (2009) investigated the effectiveness of lifeline and Linkup Programs and predict that without those two programs, the low-income telephone penetration rates would be about 5% lower.

Despite this research activity, studies on the cost-containment behavior of

telecommunication companies are limited. Zolnierek (2006) finds substantial differences between embedded and forward-looking local loop cost estimates for rural telephone companies, where embedded (accounting) costs are the ones used in USF programs. Therefore, funding driven by reported historic costs not by forward looking costs yields inefficient prices. Jayakara and Sawhney (2004) examine proposals for universal service reform, arguing that historical constraints should not limit consideration of more creative policy options. The present study focuses on the high cost support (HCS) program, the largest program of the USF programs.<sup>6</sup> The stated goal of the HCS program is to ensure that consumers in all regions of the nation have access to telecommunications services and pay rates for these services that are reasonably comparable to the rates paid in urban areas. Advocates argue that without the HCS program, consumers in high cost areas would pay significantly more for service due to difficult terrain or sparse population, which raise the cost of building telecommunications networks. On the other hand, Zolnierek (2008) finds no evidence that density is the main determinant of embedded costs. Amidst the controversy surrounding the cost and impact of USF programs, the FCC is in the process of wide-sweeping universal service reform, including re-directing funds towards the provision of broadband. Given the current condition, this study contributes to the literature by providing a better understanding on the incentives and possible distortions in response to the USF policy.

The remainder of the paper addresses the issue of cost overstatement. Section 2 surveys the institutional context and the subsidy program, while Section 3 provides theoretical motivation for firm cost overstatement under the HCLS mechanisms. Section 4 presents the data and shows the pattern of costs for the sample. Section 5 summarizes the conclusions and suggests directions for future research.

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<sup>6</sup> In addition to assistance to small, rural telephone companies with high costs, the USF includes financial assistance to (1) low income households, (2) schools and libraries, and (3) rural health care facilities. According to the report of universal service administrative company or USAC (2006), the size of HCS program is about 60% of the total size of the four USF programs. See Table 1.11, Universal service support mechanism: 2005, *Federal-State Joint Board Monitoring Report*, CC Docket No. 98-202, 2006, p.1-136.

## 2. Institution background and subsidy program

From 1998 to 2005, over \$21.85 billion in HCS was disbursed to companies designated as eligible telecommunications carriers (ETCs). An ETC provider for the HCS refers to carrier that is either designated by the state regulatory commission of the state where it operates or by the FCC if the state commission has no jurisdiction in that place. Both competitive carrier and the incumbent local exchange carrier (ILEC) can be ETCs. Today, there are six HCS mechanisms, and this study focuses on the HCLS, which has the longest history and is providing the largest portion of fund in all HCS subsidies.<sup>7</sup> Historically, the HCLS was provided to all the carriers based on their embedded costs. Now only rural carriers are eligible for such fund. In January 1988, the high-cost assistance was retargeted towards small and medium sized rural local exchange carriers (LECs)<sup>8</sup> whose costs exceed the national average.<sup>9</sup> Small and medium sized LECs are those with firms of 200,000 or fewer loops. Rural LECs are generally defined as either have less than 100,000 lines or serve predominantly rural areas.<sup>10</sup>

If an ETC's average unseparated cost per loop exceeds 115% of the national average, they can allocate 25% of their non-traffic sensitive (NTS) costs<sup>11</sup> to the interstate jurisdiction and to have those costs recovered by the HCLS program. To be more specific, for the portion of those loop costs between 115% and 150% of the national average, they would receive 65% of

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<sup>7</sup> The HCLS was formerly referred to as the USF. However, the name USF is now used to refer to all the universal service support mechanisms that the Commission developed to implement the 1996 Act. Besides the HCLS, the other five programs are safety net additive support, safety valve support, forward-looking non-rural high-cost model support (HCMS), interstate common line support (ICLS) for rate-of-return carriers, interstate access support (IAS) for price-cap carriers, and local switching support (LSS) for carriers that serve 50,000 or fewer access lines. See 47 C.F.R. § 36.601. See 47 C.F.R. § 36.601. See also 47 C.F.R. Part 54.

<sup>8</sup> A LEC is any carrier that is engaged in the provision of telephone exchange service or exchange access.

<sup>9</sup> Non-rural companies also receive USF support, where the funding mechanism was changed in 1999/2000 to target support directly to rural wire centers. These telephone companies are not examined here. A related topic is the extent to which subsidies match customer preferences. In a recent study, Hauge et al. (2009, p. 129) find “. . . that traditional subsidies for landline phones are increasingly ineffective in reaching low-income households such subsidies are designed to help.”

<sup>10</sup> See 47 C.F.R. 51.5 for the definition of a rural carrier.

<sup>11</sup> NTS costs refer to the costs of outside telephone wires, poles, and other facilities that link each telephone customer's premises to the public switched telephone network. Because all local loops can be used for making and receiving telephone calls from both state and interstate, thus these costs are allocated between the state and interstate jurisdictions. See *Federal-State Joint Board Monitoring Report*, CC Docket No. 98-202, 2006, p.3-2.

those costs reimbursement and 75% for the portion of those costs above 150% of the national average (also see Table 1).<sup>12</sup> This benchmark was established in 1988 and had not been changed since, but today the formula only applies to small and medium-sized carriers in the rural area that receive HCLS subsidies. The loop costs, by definition, refer to the costs of outside telephone wires, poles, and other facilities that link each telephone customers to the local exchange; they are part of the public switched telephone network. Loops, traditional local telephone lines, tend to be longer and more expensive to build and maintain in rural areas.

[Insert Table 1 Here]

To protect the integrity of the universal service fund and to administer the fund effectively and efficiently, in 1997, the Universal Service Administrative Company (USAC) was created to administer the USF for the FCC. It is an independent subsidiary of the National Exchange Carrier Association, Inc. (NECA). Its operations include collecting and disbursing funds, ensuring fund integrity, overseeing program accountability, and communicating with stakeholders.<sup>13</sup> For instance, USAC collects information as of the number of telephone lines, calling volumes, certain types of costs from all eligible carriers, and also conducts service quality surveys among customers. Each year, the ETCs report their costs to the USAC and receive compensation from the HCLS fund (representing part of the HCS) to cover a portion of the reported costs. The annual support provided by the HCLS has increased from \$56 million in 1986 to over \$1.47 billion in 2010,<sup>14</sup> an annual increase of 31.30% in real terms.

### **3. Theoretical motivation**

The theoretical analysis presented in this section is heuristic rather than comprehensive. The paper concludes that one of the possible reasons that ETCs can overstate their costs is because

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<sup>12</sup> Section 3-3, *December 2005 Federal-State Joint Board Monitoring Reports*. The calculation is based on the progressive principle, i.e., the funding subsidizes a larger percentage of loop costs from high cost groups than from low cost groups.

<sup>13</sup> Retrieved from USAC website: <http://www.usac.org/about/usac/usac-role.aspx>

<sup>14</sup> See Table 3.1. High-cost support fund payment history, *Federal-State Joint Board Monitoring Reports*, CC. Docket No. 98-202, 2010, p.3-15.

firms can shift part of the unseparated costs for eligible subsidies. As Zolnierek (2006, p.347) pointed out, "...it is uncertain to what degree the companies' accounting books include costs of loop infrastructure used jointly to provide local exchange and broadband service that is in excess of loop infrastructure that would be necessary absent any broadband capabilities." Cost overstatement by a manager entails a potential benefit and a potential cost. The potential benefit is an increased subsidy from the federal government. The potential cost is the penalty imposed if the cost overstatement is detected. Therefore, the subsidy maximization is in essence one kind of profit maximization. The simple model shows that a profit-maximizing firm may choose to marginally overstate its cost when such firm's marginal revenue from cost overstatement is more than its marginal cost. To structure the model, consider the following notation:

- $x$ : the firm's true per loop cost, or alternatively the maximal cost that the firm can report to the FCC with impunity.
- $t$ : the reported per loop cost above the amount " $x$ ".
- $R(\cdot)$ : the firm's revenue from FCC subsidies.
- $p(t)$ : the probability that the firm is caught misrepresenting its costs.
- $F$ : the cost the firm incurs if it is caught "cheating." For example, the firm might suffer a loss in reputation.

Using this notation, the firm's objective function is written as follows:

$$\pi(t) \equiv [1 - p(t)]R(x+t) + p(t)[R(x) - F]. \quad (1)$$

The marginal revenue of inflating cost, denoted by  $MR$ , is the expected extra revenue from a marginal increase of  $t$ , namely:

$$MR \equiv [1 - p(t)]R'(x+t) \quad (2)$$

The marginal cost of inflating cost, denoted by  $MC$ , results from the increased cost from a marginal increase of  $t$ , namely:

$$MC \equiv p'(t)[R(x+t) - R(x) + F] \approx p'(t)[R'(x)t + F]. \quad (3)$$

The approximation is given by Taylor expansion. Here the  $R'(x)$  is 0, 0.65 or 0.75. A profit-maximizing firm will continue to increase its overstatement of the cost,  $t$ , if and only if  $MR > MC$ .



In (3),  $tR'(x) \leq 0.75t$ , where  $t$  is the overstated per loop cost. As the theoretical analysis focuses on the case where a firm makes a marginal decision on cost overstatement, it is assumed that  $t$  is small, which implies that  $0.75t$  can be much smaller than  $F$ . Thus (3) implies that

$$MC \approx p'(t)F \quad (4)$$

From (4), it is hypothesized that in this case  $MC$  is similar across firms. Thus, the analysis focuses attention on  $MR$ .<sup>15</sup>

Based on the current reimbursement formula (Table 1), there are two categories of firms receiving subsidies from the USAC: if a firm's cost is above a certain threshold level, it receives a higher rate of subsidy for its reported cost above that level than it receives for a reported cost that is below the level. First, note that if a firm's cost is below but is close to the threshold level, then its incremental revenue experiences a discrete jump when  $t$  increases to the level that  $x + t$  is above the threshold level. To illustrate, if the NALC is \$240, the cutoff to qualify for 65% reimbursement above that threshold would be \$276. Assume there is a firm with per loop cost happens to be \$276, and it overstates this cost to \$277. Then the one dollar above 276 will be reimbursed by 65 cents. The subsidy will thereby increase from zero to an overall amount of reimbursement equivalent to 65 cents multiplied by the firm's total number of operating loops in the high cost area. In an extreme case, when the amount of overstatement is close to zero, the cost of conducting the cost manipulation is close to zero, and the probability of detection is also close to zero, but the expected gain is positive and substantial. Therefore, when the firm's cost is very close to the next higher threshold level, it is more likely to have  $MR > MC$ . Thus, it is hypothesized that if a firm's cost is close to the next higher threshold level, it is more likely to overstate its cost, *ceteris paribus*.

#### 4. Patterns of reported costs

This study does not try to distinguish between possible forms of cost

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<sup>15</sup> If  $p(t)$  is also a function of  $x$ , or if  $F$  varies across firms, then  $MC$  may differ across firms and the paper may not be able to draw any systematic conclusion about  $MC$ . But in this case, obviously the focus should be put on the analysis of  $MR$  to derive hypotheses.

adjustment/manipulation. Rather, it considers these (and other) possible forms of cost adjustment as potential strategies for a firm contemplating whether to exert effort to take full advantage of the prevailing regulations.

#### *4.1. Data and sample*

The sample of rural LECs is derived from the FCC Wireline Competition Bureau Statistical Reports (formerly FCC-State Link). The firms' per loop cost data come from the Yearly Federal-State Joint Board Monitoring Reports (1993 - 2005) – Section 3. The national average loop cost (NALC) data are obtained from the yearly Federal-State Joint Board Monitoring Reports shown as Total Industry Unseparated NTS Revenue Requirement per Loop in the table of high-cost loop support data.<sup>16</sup> The sample consists of all the small and median sized rural LECs that report to the USAC and receive HCLS subsidy funds in the United States from 1992 to 2002.<sup>17</sup> In the beginning of January 1988, the HCS mechanisms were targeted to increase benefits to small and medium sized LECs. However, the systematic data reporting for LEC's loop costs only started in early 1990's. Thus, the final sample comprises panel data for the 1,136 firms in 50 states from 1992 through 2002, which generate 12,496 firm-year observations. During this period, the FCC promised to provide HCLS support to eligible rural companies based on cost thresholds and company size (Table 1).<sup>18</sup>

As is shown in Table 1, the HCLS program reimburses a larger fraction of a firm's incremental costs as the level of the firm's costs rises above one of the identified thresholds (115% NALC and 150% NALC). To examine potential cost adjustments, this study focuses on these two subsidy cutoffs (65% reimbursement rate and 75% reimbursement rate); these provide very natural thresholds to split the firms into three cost ranges (*Ctg0*, *Ctg65* and *Ctg75* indicated

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<sup>16</sup> Data can also be obtained from the yearly study results of Universal Service Fund by National Exchange Carrier Association.

<sup>17</sup> Although some larger sized LECs also provide telecommunication service in rural areas and receive benefits from HCLS as well, there are very few such firms. Compared to over 11,000 observations of small and median sized LECs, there are only 84 observations of large LECs in rural areas during the period.

<sup>18</sup> Exceeding higher thresholds means a higher percentage of additional costs that are allocated between the state and interstate jurisdictions are recovered by the HCLS.

in Table 1), allowing one to study the firms' reporting of costs.

The summary statistics are shown in Table 2. As is shown, the average per loop cost in the sample is \$393.53, and the average number of loops is about 8,684. Table 2 also presents data on three other state level variables, unemployment rate, income per capita and rural population density.<sup>19</sup> Out of the 12,496 firm-year observations, there are 3,083 firms in the no subsidy category (*Ctg0*), 3,630 firms in 65% subsidy category (*Ctg65*) and 5,783 firms in the 75% subsidy category (*Ctg75*). Further comparisons are made on firm's per loop costs and the number of loops by category in Table 3. It shows that even though the mean of per loop costs at each category is different at \$251, \$324, and \$513, respectively, the firm sizes (with the number of loops as a proxy) across categories are not necessarily all statistically different. For example, the no subsidy group firms are significant larger than the other two groups, with a mean of 11,319 loops. The other two groups have 7,978 loops and 7,722 loops in the 65% subsidy category and 75% category, respectively. The t-test fails to reject the null hypothesis that they are equal at the mean. Therefore, in the sample, the no subsidy firms are larger in size and have lower per loop costs than those subsidized firms.

[Insert Table 2 and 3 Here]

#### *4.2. Evidence of cost overstatement to exceed thresholds*

As explained earlier, a firm is most likely to overstate its true cost if this cost is very close to the next higher cutoff level. If firms do indeed manage or manipulate costs to meet the thresholds, one would expect to observe relatively few firms with costs directly below the thresholds and relatively many firms at or directly above the thresholds. Other studies (e.g. Degeorge, Patel, & Zeckhauser, 1999) have used this technique to examine the density of firm costs near particular thresholds. Theory supports the observation of a marked increase in the number of firms just above each threshold if the postulated cost shifting is occurring.

The middle cost range (i.e., 115% NALC-150% NALC) length is divided into ten equal

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<sup>19</sup> The state level macroeconomic data are downloaded from Data Ferret.

and small segments, which are coded as 1 to 10 (*CostIndex*), respectively. The firms within the range are classified into the ten evenly distributed cost segments (1-10), where 10 is closest to the upper bound of the range (i.e., 150% NALC). Then, the same length of each cost segments in the middle cost range is used to define ten equal continuous segments starting from the upper end of the no subsidy range (i.e. 115% NALC) to the left. Similarly, another ten equal lengths are defined from the lower end of the 75% subsidy range (i.e. 150% NALC) to the right. Therefore, in total there are 30 equal segments on the cost per loop line with 10 segments at each range. The results are based on the pooled sample. Firms not located in this range (1,932 observations) are dropped from the sample temporarily. Along the cost-range line, there are 2,939 firms in the lower cost range (*Ctg0*), 3,630 firms in the middle cost range (*Ctg65*) and 3,995 firms in the upper cost range (*Ctg75*).

In Fig 1, the paper shows frequencies of firms in each reimbursement category based on the percentage distribution of firms. It appears that there is a smaller mass to the left of the thresholds compared to the right: there is a clear jump in the number of firms at the cutoff level.

[Insert Fig 1 Here]

To further examine the firm distribution differences at the two cutoff points, the study focuses on firms whose costs are very close to those two cutoff points. First, the paper finds that there are 36 firms (with *CostIndex*=10 in the *Ctg0* category) just below the 65% reimbursement cutoff level, but 403 firms (with *CostIndex*=1 in the *Ctg65* category) just above the 65% reimbursement cutoff point, as shown in Table 4. Not surprisingly, those firms' per loop costs are different at \$200 and \$283 at the mean, respectively. However, the number of loops or firm size is not statistically different. The t-test fails to reject the null hypothesis that they are equal at the mean. This suggests that firms around the neighborhood of the 65% reimbursement level are not very different, at least in terms of firm size. To further investigate whether the distribution of true loop costs across these categories could be skewed, the paper studies some other characteristics that may drive cost skewedness. The regression model controls for number of loops, state level per capita income, state level unemployment rate, state level rural population

density and year fixed effects. The F-test fails to reject the null hypothesis that the characteristics of those firms are statistically different. Therefore, the paper does not find support for other factors affecting cost skewedness.

Next, look at the neighborhood of 75% cutoff point. Table 4 shows that there are 304 firms (with CostIndex=10 in the *Ctg65* category) just below the 75% reimbursement level, and 573 firms (with CostIndex=1 in the *Ctg75* category) just above the 75% reimbursement level. Both per loop costs and number of loops are statistically different at the cutoff point. Then, the same regressions are run to further investigate other characteristics of those firms. Again, the F-test fails to reject the null hypothesis that the characteristics of those firms are statistically different. The F-test suggests that these firms are not quite different with all the characteristics concerned that drive the cost difference. Overall, the empirical tests do not suggest that the distribution of true loop costs across these cutoff points is skewed. The two jumps observed at the two reimbursement cutoff points suggest that there is likely to be some cost distortion among subsidy-maximizing firms due to the principal-agent information asymmetry problems.

Furthermore, in Fig 1, there is a more significant jump of firm distribution at the 65% cutoff level than that at the 75% cutoff level. This may due to the greater incentive to overstate costs when they are just below the 65% cutoff point, than when they are just below the 75% cutoff point. This is because in the 0% reimbursement range, firms can be reimbursed 65% more by crossing the 65% cutoff level, while in the 65% reimbursement range, firms can only be reimbursed 10% (=75% - 65%) more by crossing the 75% cutoff point. Overall, all these findings are consistent with the cost overstatement (cost-shifting) hypothesis.

[Insert Table 4 Here]

#### *4.3 Discussion of cost overstatement*

The cost overstatement stems from an information asymmetry between the administrative agency USAC and rural LECs. The USAC allocates the subsidies based on the per loop costs reported by each rural LEC, but as Zolnierrek (2006, p.353, footnote 23) pointed out “...there are

numerous incentives for these companies to misrepresent costs - the most obvious is, as noted by Zolnierek (2004), that by overstating costs a company might increase its regulator controlled price and/or collect more universal service support subsidies”.

The overstatement can be implemented by shifting the per loop cost across different accounts or over time (cost shifting) or simply by exaggerating actual costs. For instance, a firm might attempt to increase the subsidy it receives by manipulating its measured total loop costs. This could occur when it is difficult to separate the costs of constructing facilities that are employed to serve end users both in high-cost and non-high-cost areas. In addition, Zolnierek (2006, p.347) mentioned that “with respect to broadband capabilities, no public information exists that permits an assessment of the degree to which the facilities deployed for the provision of local exchange and exchange access service are designed to accommodate wireline-based xDSL or other broadband services and/or the extent to which the company includes or excludes broadband related costs in its accounting books.” This makes it even more difficult to identify the portion of costs that are eligible for high cost support. Manipulation of costs can increase the book value of per loop costs without additional outlays.

This paper does not present hard evidence regarding how a rural LEC misreports costs. In principle, accounting procedures might prevent such misreporting. This study focuses on the distribution gap across two thresholds every year. This gap increases from 1992 until 1998, but it starts to decrease (or increase much less than before) after 1998 (as shown in Appendix A1). Perhaps this decrease is due to the establishment of USAC in 1997 which started to publish firm cost data in 1999. However, Zolnierek (2008) notes that in its investigation of annual access charges filed by NECA on behalf of certain of its member companies, the FCC recently found that ‘...incomplete accounting that NECA provides of company-wide revenues, expenses, income, and rate base renders us unable to determine the validity of NECA’s final interstate returns...’. The empirical tests in this paper could be strengthened by controlling for more firm-level factors that affect cost expenditures, but “despite the importance of such information, public access to the development and calculation of embedded cost data is extremely limited”

(Zolnierrek, 2008, p.271). Therefore, future research should direct attention to this data limitation issue.

## **5. Conclusion**

In conclusion, this study finds that under the FCC's universal service fund HCLS mechanism, cost overstatement is likely; the impacts of incentives created by the program are especially pronounced when firm's per loop cost is close to the next higher cutoff reimbursement level. From the standpoint of regulatory policy, it is important to be able to identify strategic adjustments to the current cost reporting system. However, this paper has not empirically distinguished among the different forms of cost adjustment due to data limitations.

It is also beyond the scope of this study to identify specific ways operators might overstate costs: detecting misallocations and production inefficiencies from accounting statements is no simple task; during the period under study, few resources were devoted to sorting out such issues. The key point developed here is that the pattern of reported costs is fully consistent with operators padding or misreporting costs due to underlying incentives to qualify for higher levels of subsidies. It is sometimes difficult to differentiate loop costs for interstate and intrastate use, and it is difficult to separate administration costs that are associated with them. The technical difficulty leaves flexibility for companies to exercise discretion on cost reporting. The resulting activity may not be illegal, but it does lead to distortions in the use of money paid by universal service fund payers. Furthermore, as was mentioned at the beginning of the paper, some service providers do transfer some fund payments to the end-users. Such a vicious cycle undermines the ultimate goal of universal service fund mechanism.

Given recent initiatives to expand broadband access in the United States,<sup>20</sup> policy-makers need to critically evaluate the impacts of past subsidy programs in telecommunications. Since firms' true loop costs are not observable, analysts must be cautious when making a prediction of

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<sup>20</sup> For example, the American Recovery and Reinvestment Act of 2009 funded broadband initiatives in unserved, underserved, and rural areas.

the magnitude of inefficiency associated with the problem of this cost overstatement. The reimbursement fund received by each company is based on its number of loops. The total number of loops in the sample is about 10 million. To give a general idea, if each of the 1,136 companies overstate cost by only \$1, this will raise the total amount of subsidy fund by \$10 million for one year, and \$120 million over twelve years. As the average cost growth is much higher than that, this billion dollar program may already have involved huge waste. Over the next decade, the FCC may create the Connect America Fund that is supposed to shift up to \$15.5 billion from the existing USF program (including the entire \$4.6 billion High Cost component of the USF) to support access to broadband.<sup>21</sup> The program would also broaden the USF contribution base, so the continuation (and expansion) of such support seems likely.

It is important to ask whether the HCLS program has met its objectives in a cost-effective manner so the design of any new system avoids the types of inefficiencies identified here. It is also important to analyze not just the moral hazard issue that this mechanism presents, but also the implications for how the United States might consider future policies for broadband communications. If subsidy recipients respond to the USF incentives by overstating reported costs, then expanding the subsidy system might be an expensive, and ultimately ineffective, method for promoting broadband service expansion. Direct subsidies to consumers or auctioning the subsidies would be neutral with regards to technology platform and competitors. Unless incentives ensure that only the most efficient companies obtain subsidies to provide quality service to rural areas, the potential for further waste is substantial.

### **Acknowledgements**

The authors are greatly indebted this journal's reviewers, whose suggestions greatly improved this paper. In addition, David Sappington provided helpful comments and suggestions. The authors are grateful to Chunrong Ai, Simon Fan, Mark Jamison, seminar participants at University of Florida, and participants at the Southern Economics Association conference for

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<sup>21</sup> See *National Broadband Plan Connecting America*, Chapter 8, Recommendation 8.6, p.147. Retrieved from <http://download.broadband.gov/plan/national-broadband-plan-chapter-8-availability.pdf>



helpful comments. Finally, they also thank the Public Utility Research Center, University of Florida, for financial and data support; however, the views expressed here do not necessarily represent those of sponsoring organizations.

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Table 1. Embedded high-cost loop fund formulas for firms with 200,000 or fewer loops

Cost Range as % of National Average	Expense Adjustment within Range	Categorical Dummy Variables
0% - 115%	0%	"Ctg0"
115% - 150%	65%	"Ctg65"
150% and above	75%	"Ctg75"

Notes: Firms with 200,000 or fewer loops are considered to be small and medium sized firms. These values have been used since 1988. Beginning January 1, 2000, these are only applicable to rural companies and to hold-harmless support for non-rural companies.

Table 2. Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Per Loop Costs	12496	393.53	143.49	72.17	997.89
Number of Loops	12496	8684.15	17677.60	18.00	193431.90
Unemployment Rate	12496	4.70	1.38	2.30	11.00
Income Per Capita	12496	24492	4185.94	14559	42930
Rural Density	12469	0.35	0.18	0.00	0.83

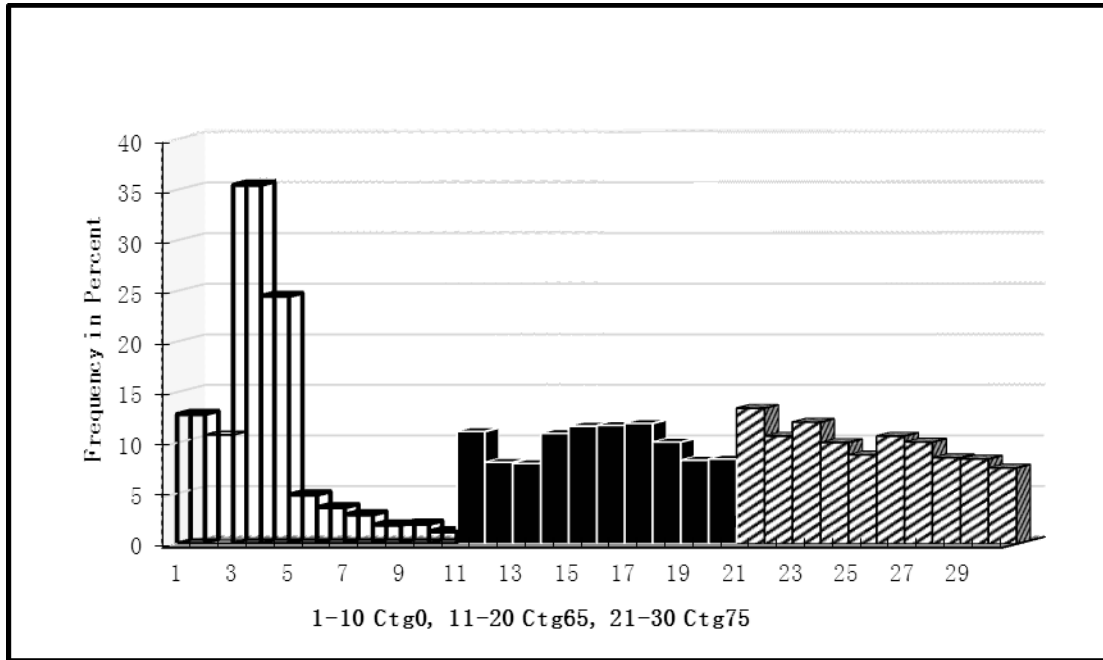
Table 3. Comparison of per loop costs and number of loops by category

	Obs	Mean (Per Loop Costs)	Mean (Number of Loops)	t-test
Ctg0	3083	251.3588	11319.40	} 7.3141
Ctg65	3630	324.425	7978.45	
Ctg75	5783	512.6966	7722.22	} -0.7172

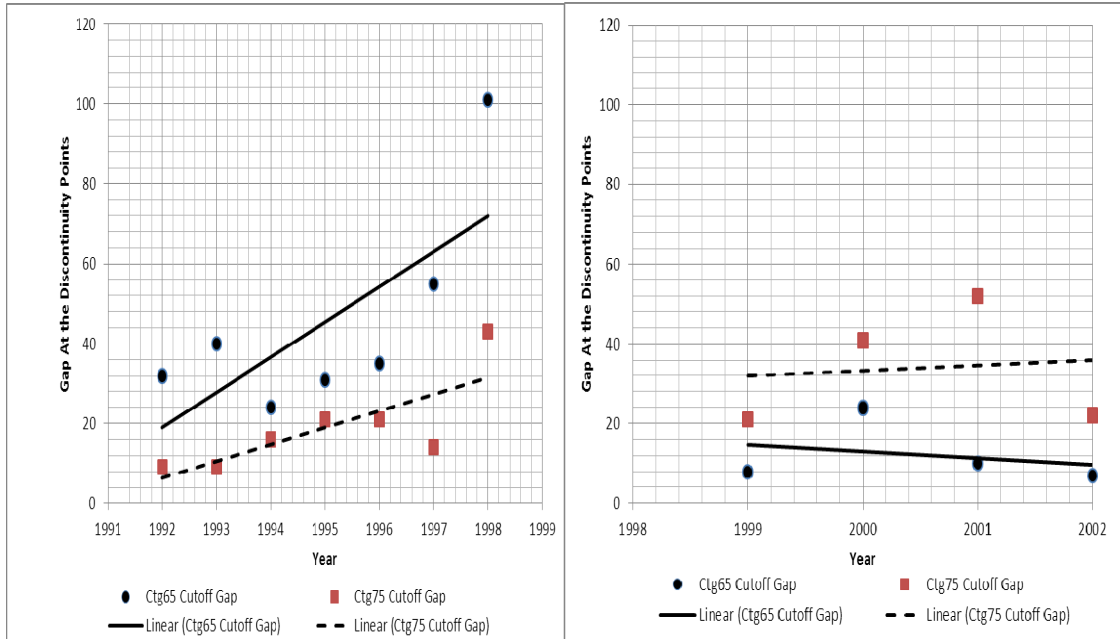
Table 4. Comparison at the Ctg65 and Ctg75 cutoff points

Group	Obs	Mean (Per Loop Costs)	Mean (Number of Loops)	
CostIndex=10 and Ctg0	36	200.09	13663.53	F-test
CostIndex=1 and Ctg65	403	283.31	9267.02	1.14
Diff		-83.22	4396.51	p-value
t-test		-73.12	1.1875	0.3243
p-value		0.00	0.2357	
CostIndex=10 and Ctg65	304	363.36	9148.22	F-test
CostIndex=1 and Ctg75	573	376.50	6783.86	1.12
Diff		-13.14	2364.36	p-value
t-test		-18.56	1.9336	0.1269
p-value		0.00	0.0535	

Fig 1. Frequencies distribution



## Appendix A1.



This figure shows the trend of the gap between service providers just below the subsidy threshold and those above it. The dot and solid line show the gap at the 65% reimbursement cutoff point, and the square and dotted line show the gap at the 75% reimbursement cutoff point. The left figure shows the trend from 1992 to 1998 and the right figure shows the trend from 1999 to 2002.